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(74) **Agent:** OLSSON, Gunnar; Nobel Biocare AB (publ),
P.O. Box 5190, S-402 26 Göteborg (SE).

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(71) **Applicant** (for all designated States except US): **NOBEL BIO CARE AB (PUBL)** [SE/SE]; Box 5190, S-402 26 Göteborg (SE).

(72) Inventor: and

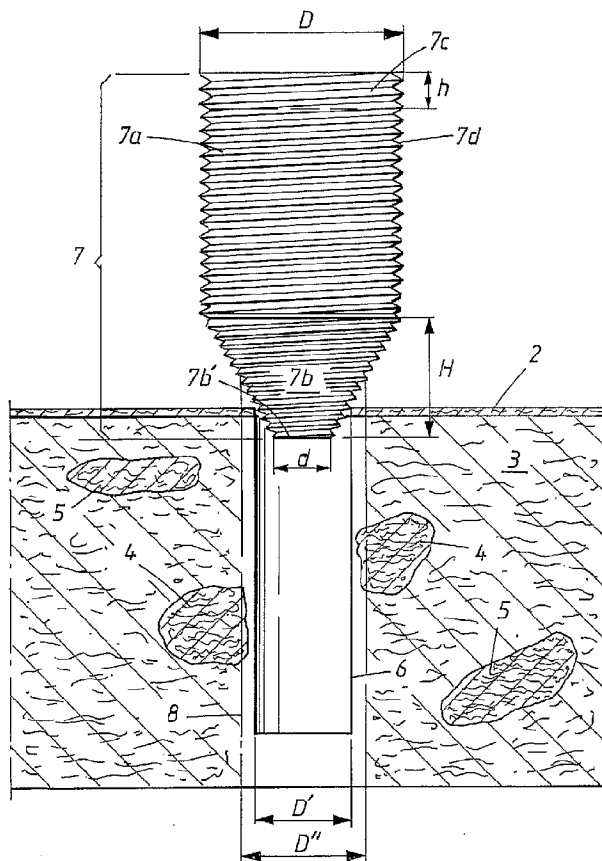
(75) **Inventor/Applicant (for US only):** MALO CARVALHO, Paulo [PT/PT]; Avendida dos Combatentes 43-43A., 9C+D, 1600 Lisboa (PT).

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(54) Title: FIXTURE FOR ANCHORING IN JAW BONE



(57) Abstract: To anchor a fixture (7) in a jaw bone (1), the fixture is applied in a hole (6) which is substantially smaller than the diameter of the fixture. The fixture has a front portion (7b) which from the point of view of diameter grows very much narrower and which is arranged with both a cutting function and a threading function. The fixture is provided with a thread, with one, two or more thread turns extending down along the greatly narrowing portion while substantially maintaining their thread profile. One or more porous layers arranged on the thread turns can also be included. In this way the fixture can exploit the clamping effect from the soft parts (3) of the jaw bone and still effectively penetrate through any hard parts (4, 5) possibly present in the jaw bone, without these hard parts being pressed inward upon fixture application. An effective fusion of the fixture (7) in the jaw bone (1) is achieved with the aid of said porous outer layers (20).



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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Fixture for anchoring in jaw bone

The present invention relates to an arrangement in the form of a fixture for effective anchoring even in a jaw
5 bone with a combination of soft and hard bone portions (or inlays/grafts), which fixture can be applied in a hole having a diameter smaller than the diameter of the fixture in order to produce a clamping effect on the implant from the soft bone portion or portions.

10

It is already known to adapt implants individually to soft and hard bones. Various implants and methods have been proposed to meet the different requirements which arise in hard jaw bone and soft jaw bone situations,
15 and two different implant types and implant characters have in principle been used for the two different bone types.

For example, in a fixture or implant exclusively for
20 soft jaw bone, it is possible to use a slightly conical implant in accordance with Swedish patent 516 917 obtained by the same Applicant as is filing the present application. The implant is in this case provided with thread turns which permit excellent integration with
25 the bone substance and prevent breaking-off of fine bone trabeculae when the fixture is being screwed into the bone.

However, there are clinical situations in which soft
30 jaw bone may be present in combination with hard jaw bone portions or grafts with different degrees of hardness, which are located like islands amid the softer jaw bone. The present-day fixtures for soft bone which are applied in holes with a smaller diameter than
35 the fixtures concerned have a limited ability to expand and penetrate the hard bone portions or equivalent in question, and instead have the result that the fixtures press the hard bone portions aside. In addition, the hard bone portions may interfere with the threading of

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the bone. All of this can result in unsatisfactory or defective fixture installations.

5 The object of the present invention is to solve this problem, inter alia, and it proposes a fixture arrangement which is suited both for exclusively soft jaw bone portions and also for soft jaw bone portions where there are also hard jaw bone parts or equivalent. The invention also goes further and proposes that the
10 novel fixture structure will comprise additional means for promoting the firm attachment of the fixture in the jaw bone.

That which can principally be regarded as
15 characterizing the novel fixture is that it comprises a front portion which from the point of view of diameter grows very much narrower and which is arranged with both a cutting function and a threading function and is thus able, upon contact with a hard bone portion or
20 portions, to penetrate through these without causing any substantial tendency for displacement of the respective hard bone portion. A further characteristic is that the thread, which can have one, two or more thread turns, extends along the greater part of the
25 outer surface of the fixture and also down along the greatly narrowing portion while substantially maintaining its thread profile.

A further characteristic feature of the invention is
30 that the fixture is specially adapted for holes with a considerably smaller diameter than the main diameter of the fixture. This is achieved by means of the greatly narrowing design of the tip, which facilitates entry even into underprepared areas.

35 The characteristics listed above permit, in comparison with existing products, improved application of the invention both in soft bone and also in soft bone with interspersed portions of hard bone.

According to a preferred embodiment, one or more porous outer layers are used which are arranged on the thread/thread turns and which ensure effective fusion
5 of the fixture in the jaw bone.

Further characteristics of the invention are set out in the attached subclaims.

10 By means of the invention it is thus possible to satisfy the abovementioned requirements for a much effective fixture installation. Double or multiple threads can be obtained by proven techniques and a more prominent feature in this respect is that the double or
15 multiple thread will extend downward along the greatly narrowing front portion whose cutting function can also be designed in a known manner. The front end can effectively enter and penetrate through hard areas of the jaw bone when the fixture is being screwed into the
20 hole. The proposed porous layers can be formed in a known manner. For example, they can consist of oxide layers of the type included in the TiUnite® fixtures sold on the market by Nobel Biocare.

25 A presently proposed embodiment of a fixture having the features of the invention will be described below with reference to the attached drawings, in which:

Figure 1 is a vertical cross section showing the
30 fixture in association with a jaw bone having different degrees of hardness,

Figure 2 is a side view showing an embodiment of the
35 fixture,

Figure 3 is a longitudinal section showing the fixture according to Figure 2,

Figure 4 is an end view of Figure 2, showing the

cutting edges arranged on the fixture,

Figure 5 is another end view of the fixture according to Figure 2, showing the arrangement for application of screwing tools,

Figure 6 is a longitudinal section showing parts of a thread with double turns arranged on the fixture, and

10

Figure 7 is a vertical section showing parts of the thread structure on the fixture according to Figure 2.

15 In Figure 1, a jaw bone is indicated diagrammatically by 1. The jaw bone can comprise different portions of bone, a first layer of hard bone having been indicated by 2, and a second predominant layer of soft bone having been indicated by 3, and islands of harder bone indicated by 4, 5. A hole 6 has been arranged in a manner known per se in the jaw bone, and a fixture 7 is to be screwed into the hole. The fixture has a first part 7a which can be cylindrical or slightly conical. The fixture also comprises a front portion 7b which
25 narrows greatly toward its front end, from the point of view of its diameter. It also includes a collar-like attachment part 7c of substantially the same diameter D as the cylindrical part 7a. The front end surface 7b' on the front, greatly narrowing portion 7b has an end surface diameter d. In one embodiment, D has a value of ca. 4 mm, and d has a value of ca. 2 mm. The portion 7b has a height H which substantially corresponds to the diameter value d. The collar-shaped part 7c has a height h of ca. 1-3 mm. The configuration shown means
30 that the fixture 7 can enter holes 6, 8 with different diameters D' and D'' which are much smaller than the main diameter D of the fixture and can penetrate through the actual portion or portions of hard bone, for example the bone portion or the islands 4, 5. The

arrangement means that the fixture can expand and also penetrate through hard bone portions and still cooperate with soft bone portions, for example the bone area 3, so that this applies clamping forces against
5 the side surface 7d of the fixture.

In accordance with Figure 2, the fixture 7 is provided with an outer thread 11, preferably with two or more thread turns. Apart from the part 7c, the thread 11
10 extends along the remaining length L' of the fixture, i.e. also down along the portion 7b to its end 7b'. The total length of the implant is indicated by L. According to Figure 4, the fixture 7 is provided with four cutting edges 12, 13, 14 and 15. A distance
15 between the outer margin of the edge 13 and the center line 16 of the fixture is indicated by A.

Figure 5 shows an arrangement for applying a turning or screwing tool (not shown). The arrangement has been
20 symbolized by 17 and can be formed in a manner known per se, for which reason it will not be described in detail here.

Figure 3 shows the fixture 7 in longitudinal section, depicting the lines of the front portion 7b and of the double threads 11. The fixture has inner recesses 18
25 for said tightening arrangement 17 and for application of superstructures which are to be applied to the fixture after it has been installed in the jaw bone.

30 Figure 6 shows an example of the thread profile 19, for instance a thread with two thread turns. As the technique according to Swedish patent 516 917 can be used for producing the double thread in question, the arrangement will not be described in detail here, and
35 instead reference is made to the patent in question.

Figure 7 shows the case where the thread arrangement 11 in accordance with the invention is provided with a

porous layer symbolized by 20. The production of porous layers of this kind has also been described in detail by the same Applicant as is filing the present invention, and for this reason reference is made to
5 these patents. In one embodiment, the porous layer can constitute a magazine for a bone-growth-stimulating substance or agent 21. This too is known per se and is set out in the last-mentioned patent.

10 In one illustrative embodiment, the total length L of the implant can be ca. 9.25 mm, and the threaded length L' can be of the order of 7.75 mm.

The invention is not limited to the abovementioned
15 embodiment and instead can be modified within the scope of the attached patent claims and the inventive concept.

PATENT CLAIMS

1. An arrangement in the form of a fixture (7) for
5 effective anchoring even in a jaw bone (1) with a
combination of soft and hard bone portions (or
inlays) (2,3,4,5), which fixture can be applied in
holes (6, 8) with diameters (D' , D'') which are
substantially smaller than the diameter (D) of the
10 fixture so as to produce a clamping effect (10) on
the implant from the soft bone portion or
portions, characterized by a front portion (7b)
which from the point of view of diameter grows
very much narrower and which is arranged with both
15 a cutting function (12, 13, 14, 15) and a
threading function (11) and is thus able, upon
contact with a hard portion or portions, to
penetrate through these without causing any
substantial tendency for displacement of the
20 respective hard bone portion, and a thread (11)
which has one, two or more thread turns and
extends along the greater part of the outer
surface of the fixture and also down along the
greatly narrowing portion (7b) while substantially
25 maintaining its thread profile.
2. The arrangement as claimed in patent claim 1,
characterized in that the greatly narrowing front
portion (7b) has a height (H) which is
30 substantially equal to the diameter (d) of the end
surface, e.g. ca. 2 mm.
3. The arrangement as claimed in patent claim 1 or 2,
characterized in that the fixture (7) is arranged
35 without a stop flange at its rear parts (7c).
4. The arrangement as claimed in any of patent claims
1, 2 or 3, characterized in that the fixture is
provided at its tip with a diameter (d) of ca.

2 mm.

5. The arrangement as claimed in any of the preceding patent claims, characterized in that the attachment part (7c) of the fixture for a tool and replacement component is ca. 0-3 mm in the longitudinal direction of the fixture.
5
6. The arrangement as claimed in any of patent claims 1-5, characterized in that the greatly narrowing front portion (7b) is arranged with a straight or slightly curved lateral surface.
10
7. The arrangement as claimed in any of patent claims 1-6, characterized in that the greatly narrowing front portion is designed to cooperate with and pass through holes (6, 8) of different diameters in the soft bone portion (3).
15
8. The arrangement as claimed in any of patent claims 1-7, characterized by one or more porous outer layers (20) which are arranged on the threaded portion and which ensure more effective fusion of the fixture (7) in the jaw bone (1), the porous layer (20) consisting of or comprising an oxidation layer, for example TiUnite®.
20
25
9. The arrangement as claimed in any of patent claims 1-8, characterized in that the porous layer or porous layers are provided with bone-growth-stimulating substance (21).
30
10. The arrangement as claimed in any of patent claims 1-9, characterized in that the cutting edges on the greatly narrowing portion are two, three or four in number.
35

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Fig. 1

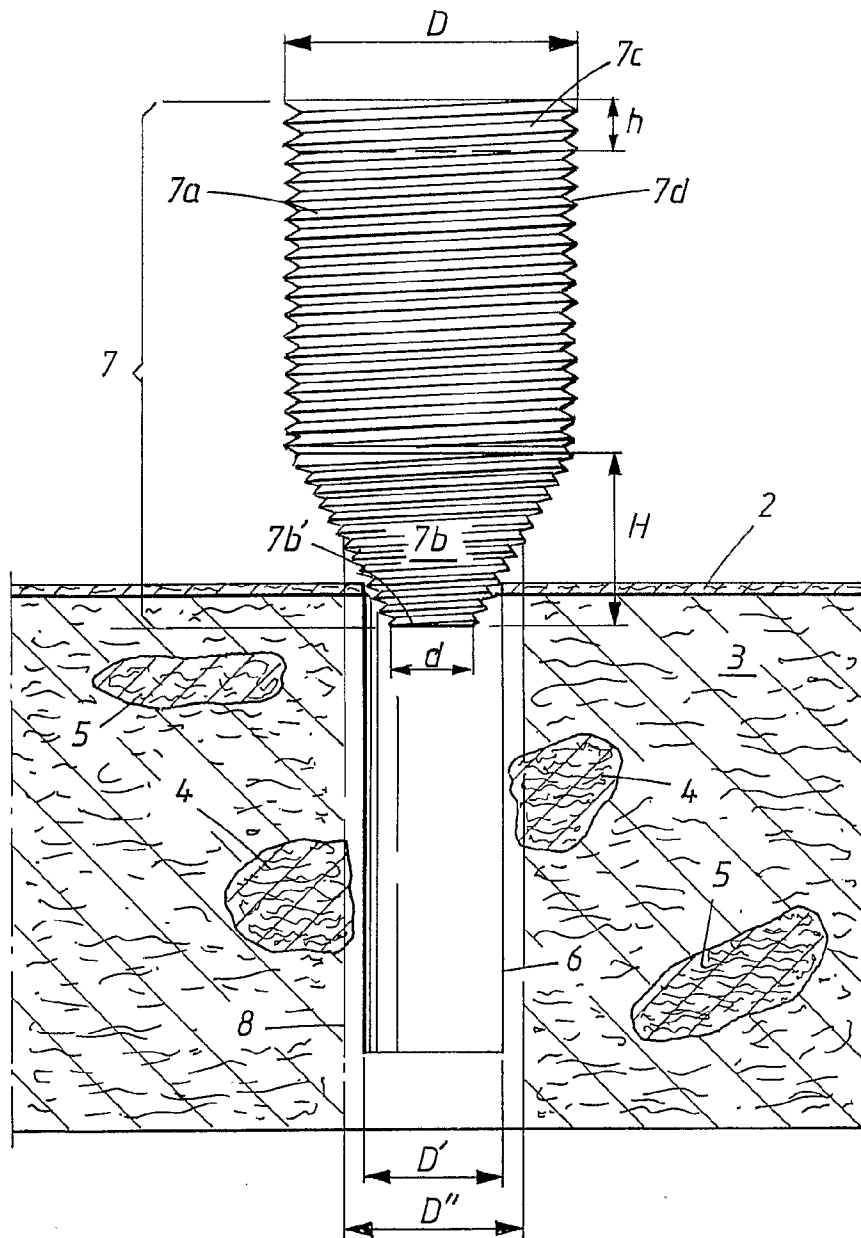


Fig. 5

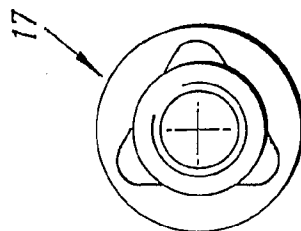


Fig. 2

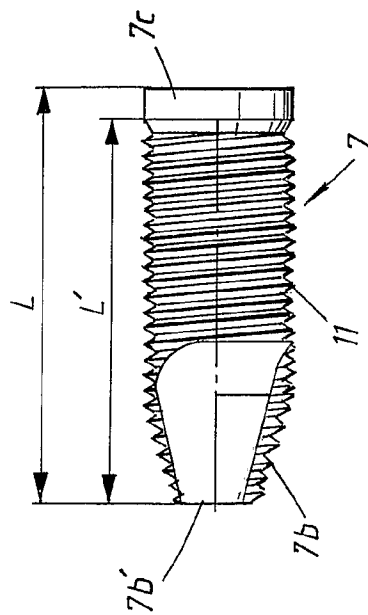


Fig. 7

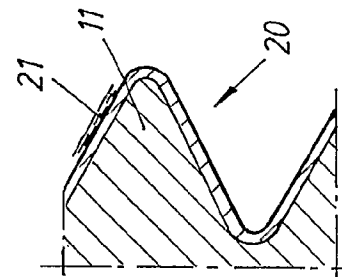


Fig. 3

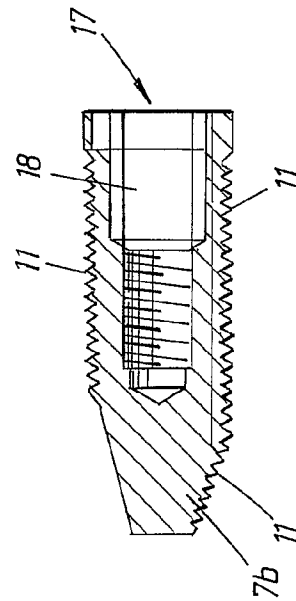


Fig. 6

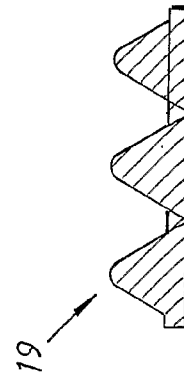
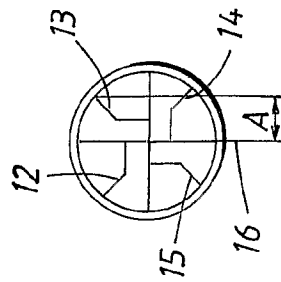


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/000532

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61C 8/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9743976 A1 (NOBEL BIO CARE AB), 27 November 1997 (27.11.1997), page 4, line 23 - page 5, line 9; page 7, line 13 - line 25, figures 1-4, abstract	1-10
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A	US 6375465 B1 (FREDRIK ENGMAN ET AL), 23 April 2002 (23.04.2002), abstract	1-10
	--	
A	WO 0053117 A1 (NOBEL BIO CARE AB), 14 Sept 2000 (14.09.2000), abstract	1-10
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

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5 July 2004

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Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Nils Nordin/MP

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/000532

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0249200 A2 (BIOLOK INTERNATIONAL, INC.), 12 July 2001 (12.07.2001), claims 1-5, abstract -- -----	1-10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/000532

WO	9743976	A1	27/11/1997	AT	255375	T	15/12/2003
				AU	738974	B	04/10/2001
				AU	2919997	A	09/12/1997
				CA	2255749	A	27/11/1997
				DE	69726572	D	00/00/0000
				EP	0904028	A,B	31/03/1999
				JP	2000513606	T	17/10/2000
				SE	506596	C	19/01/1998
				SE	9601913	A	18/11/1997
				US	6196842	B	06/03/2001

US	6375465	B1	23/04/2002	AU	740669	B	08/11/2001
				AU	1680797	A	02/09/1997
				AU	5786898	A	07/08/1998
				CA	2276754	A	23/07/1998
				EP	0963183	A	15/12/1999
				JP	2001508342	T	26/06/2001
				SE	512050	C	17/01/2000
				SE	9700155	A	22/07/1998
				WO	9831296	A	23/07/1998
				SE	511273	C	06/09/1999
				SE	9800075	A	16/07/1999

WO	0053117	A1	14/09/2000	AU	3848900	A	28/09/2000
				CA	2364126	A	14/09/2000
				EP	1161197	A	12/12/2001
				JP	2002537941	A	12/11/2002
				SE	514142	C	08/01/2001
				SE	9900822	A	10/09/2000

WO	0249200	A2	12/07/2001	AU	1725302	A	24/06/2002
				EP	1342311	A	10/09/2003
				FR	2818050	A	14/06/2002
				US	2004070914	A	15/04/2004
